WE CLAIM:

1. A light emitting diode (LED) with enhanced light extraction structures, comprising:

an LED structure having:

an epitaxially grown p-type layer;

an epitaxially grown n-type layer; and

an epitaxially grown active layer between said p-type and n-type layers;

a first spreader layer adjacent to said LED structure;

a second spreader layer adjacent to said LED structure, opposite said first spreader layer; and

light extraction structures disposed integral with said LED, said light extraction structures providing surfaces to allow light trapped within said LED to disperse, reflect and/or refract out of said LED.

2. The LED of claim 1, further comprising a substrate adjacent to said first spreader layer, opposite said LED structure.

3. The LED of claim 1, wherein said substrate is electrically conductive and serves as a spreader layer.

4. The LED of claim 1, wherein said light extraction structures are disposed in a plane parallel to said layers and substantially covering the area of said LED.

5. The LED of claim 4, wherein said light extraction structures comprise an array of light extraction elements.

6. The LED of claim 5, wherein said LEEs have curved surfaces.

7. The LED of claim 5, wherein said LEEs have piecewise linear surfaces.

8. The LED of claim 1, wherein said light extraction structures comprise a disperser layer.

9. The LED of claim 8, wherein said disperser layer comprises a layer of microspheres.

10. The LED of claim 9, said microspheres have a different index of refraction than said LED layers.

11. The LED of claim 8, wherein said disperser layer comprises a roughened layer of material within said LED.

12. The LED of claim 11, wherein said roughened layer has a different index of refraction than said LED.

13. The LED of claim 1, wherein said light extraction structures are disposed on said second spreader layer, opposite said LED structure.

14. The LED of claim 2, wherein said light extraction structures are disposed on the surface of said substrate, opposite said first spreader layer.

15. The LED of claim 1, wherein said light extraction structures are disposed internal to said LED.

16. The LED of claim 15, wherein said light extraction structures have a different index of refraction than said LED layers.

17. The LED of claim 2, wherein said light extraction structures are disposed on the interface between said substrate and said first spreader layer, said structures substantially within said first spreader layer.

18. The LED of claim 2, wherein said light extraction structures are disposed within said first spreader layer.

19. The LED of claim 2, wherein said light extraction structures are disposed on the interface between said substrate and said first spreader layer, said structures substantially within said substrate.

20. The LED of claim 1, further comprising a first contact on said first spreader layer and a second contact on said second spreader layer, a bias applied across said contacts causing said LED to emit light.

21. The LED of claim 2, wherein said substrate is conductive and said LED further comprises a first contact on said substrate and a second contact on said second spreader layer, a bias applied across said contacts causing said active layer to emit light.

22. The light emitting diode of claim 2, further comprising:

a submount;

a reflective layer disposed on said LED structure; and

a second spreader layer on said submount and affixed to said reflective layer opposite said LED structure;

a bias applied across said first and second conductive layers causing said active layer to emit light, said substrate being the primary emission surface.

23. A light emitting diode with enhanced light extraction, comprising

a p-type layer;

an n-type layer;

an active layer between said p-type and n-type layers wherein either said p-type or n-type layer is a top layer and the other said layer is a bottom layer;

a first spreader layer adjacent to said bottom layer;

a second spreader layer on said top layer;

respective electrical contacts on said spreader layers so that a bias applied across said contacts causes said active layer to emit light;

a substrate adjacent to said first spreader layer; and

light extraction structures integral with said layers, running parallel to said layers and substantially covering said LED, said light extraction structures providing surfaces to allow light trapped within said LED to disperse, reflect and/or refract out of said LED.

24. The LED of claim 23, wherein said light extraction structures comprise an array of light extraction elements (LEEs) having curved or piecewise linear surfaces.

25. The LED of claim 23, wherein said light extraction structures comprise a disperser layer.

26. The LED of claim 25, wherein said disperser layer comprises a roughened layer of material within said LED.

27. The LED of claim 23, wherein said light extraction structures are disposed on said second spreader layer, opposite said top layer.

28. The LED of claim 23, wherein said light extraction structures are disposed on the surface of said substrate, opposite said first spreader layer.

29. The LED of claim 23, wherein said light extraction structures are disposed internal to said LED layers.

30. The LED of claim 23, wherein said light extraction structures are disposed on the interface between said substrate and said first spreader layer, said structures substantially within said first spreader layer.

31. The LED of claim 23, wherein said light extraction structures are disposed within said first spreader layer.

32. The LED of claim 23, wherein said light extraction structures are disposed on the interface between said substrate and said first spreader layer, said structures substantially within said substrate.

33. A light emitting diode (LED) with enhanced light extraction, comprising:

an LED structure having:

an epitaxially grown p-type layer;

an epitaxially grown n-type layer; and

an epitaxially grown active layer between said p-type and n-type layers;

a reflective layer deposited on said LED structure;

a second spreader layer on said reflective layer;

a submount on said second spreader layer;

a first spreader layer adjacent said LED structure, opposite said reflective layer;

a bias applied across said first and second spreader layers causing said active layer to emit light, said substrate becoming the primary light emission surface; and

light extraction structures integral with said LED, said light extraction structures running parallel to said LED structure and substantially covering the area of said LED.

34. The LED of claim 33, wherein said light extraction structures comprise an array of light extraction elements (LEEs) having curved or piecewise linear surfaces.

35. The LED of claim 33, wherein said light extraction structures comprise a disperser layer.

36. The LED of claim 33, further comprising a p-contact on said submount and adjacent to said second spreader, a conductive media between said submount and said first spreader layer, and an n-contact on said submount and adjacent said conducting media, a bias applied across said p- and n-contacts causing said LED structure to emit light.

37. A method for growing a light emitting diode having an internal disperser layer to enhance light extraction,

comprising:

placing a substrate in a reactor for growing semiconductor materials;

growing a first semiconductor layer on said substrate, said first layer having a rough surface;

stopping growth of said semiconductor layer;

growing a disperser layer of semiconductor material on said roughened layer, said disperser layer having a different index of refraction than said first layer;

growing a second layer on said disperser layer, said second layer having a similar index of refraction as said first layer; and

growing a semiconductor light emitting structure on said second layer.

38. The method of claim 37, wherein said light emitting diode is AlInGaN based and said first layer is grown rough by increasing the flow of disiline, changing the flow of ammonia, or increasing the rate that said first layer is grown.

39. The method of claim 37, wherein said light emitting diode has a first spreading layer and said disperser layer is grown within said spreading layer.

40. A method for manufacturing an AlInGaN light emitting diode with an internal disperser layer to enhance light extraction, comprising:

placing a substrate in a reactor for growing semiconductor materials;

growing uncoalesced islands of material made of $Al_xIn_yGa_{1-x-y}N$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, on said substrate;

stopping the growth of islands;

depositing a disperser layer on said uncoalesced islands, said disperser layer having a different index of refraction from said highly doped GaN material;

growing a layer of material made of $Al_xIn_yGa_{1-x-y}N$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, on said disperser layer, said layer having a smooth surface; and

growing a light emitting structure on said layer.